

Product Information Note

Profit® Blend Optimizer (PBO) Property Control & Optimization for In-line Blending



Honeywell's Profit Blend Optimizer (PBO) is designed specifically for on-line blend reformulation and optimization. It controls and optimizes the operation of in-line blenders which produce a wide variety of products such as gasoline, distillate and fuel oils. PBO can also be applied to crude oil or chemical blending applications.

Benefits include:

- **Reduced property giveaway** through ensuring that all quality specifications are met, while minimizing property giveaway for selected properties.
- **Optimal component use** through use of an objective function that minimizes cost while meeting all quality requirements.
- **Lower product inventory** by reducing touch-ups and reblends, and supporting on-line blend certification.
- **Lower component inventory** by supporting use of unit rundown streams and providing optimal component usage for property correction.
- **Lower number of touch-ups and reblends** by ensuring that the blend is on-specification for all properties the first time.

Key Capabilities

Profit Blend Optimizer is part of Honeywell's Profit® Blending Suite within the Profit Blending and Movement solution. PBO provides property control and optimization for in-line blending processes which add several streams together in a common header at a ratio specified by the blend recipe. PBO provides the following key capabilities:

- Powerful Blend Optimization
- Flexible Blending Objectives & Control Modes
- Comprehensive Blend Optimization Model based on customer data and rules
- Blend Quality Monitoring
- Multi-Blender Optimization
- Support of Continuous Rundown Blends
- Flexible Reporting
- Offline Optimization
- OPC Compliancy and XML Support

These key capabilities are described below:

Blender	Blend State	Blend Mode	Report	Comments	Optim - Property	Optim - Component
Mogas A	Steady State	Ratio				
Recipe: MCGAS-A 97	Revision: 8.0 - T912	Product: Regular	No: 111			
Grade: Regular	Destination: T912	Start Time: 12/8/2014 14:33	Current: 484			
Batch: NoMA	Time Remaining: 194.24	End Time: 12/17/2014 17:43	Target: 100012			
Vol BBL	Flow BPH					
			512			515
<div style="display: flex; justify-content: space-between;"> Stop Blend Immediate Stop Change Recipe </div>						
Optimizer Mode: Warm	Optimization State: Soln_Found	Predicted Result: OffSpec	Cycle Number: 13	Production Browser		
Source	Material	Recipe	Flow	Status	Pump	
1 BAFcv101	T953	Alkyren	0.00 %	Stopped	Pmp.101	
2 BAFcv102	T904	HeavyCatNaphtha	65.00 %	335 BPH Running	Pmp.102	
3 BAFcv103	T940	HydrotreatedNaph	0.00 %	0 BPH Stopped	Pmp.103	
4 BAFcv104	T941	LightCatNaphtha	5.00 %	26 BPH Running	Pmp.104	
5 BAFcv105	T942	LightStraightRun	11.00 %	57 BPH Running	Pmp.105	
6 BAFcv106	T949	Reform8	0.00 %	0 BPH Stopped	Pmp.106	
7 BAFcv107	US T946	Butane	19.00 %	95 BPH Running	Pmp.107	
8 BAFcv108			0.00 %	0 BPH Stopped	Pmp.108	
9 BAFcv109			0.00 %	0 BPH Stopped	Pmp.109	
10 BAFcv110			0.00 %	0 BPH Stopped	Pmp.110	
Booster Pump Status: BPMP100						

Profit Blend Optimizer integrates with Honeywell's Profit® Blend Controller or other in-line blend controllers.

Powerful Blend Optimization

PBO uses a powerful, state-of-the-art non-linear optimizer which executes at every control interval to adjust the blend recipe based on analyzer feedback. The problem statement for the optimizer is contained in the recipe information, which includes:

- Recipe target values for each component
- Component limits (percent/volume)
- Component weighting factors
- Property limits
- Property weighting factors
- Target blend flow and volume
- Component blend values (typically lab data)

Flexible Blending Objectives & Control Modes

Since the blending goal(s) can change from blend to blend depending on factors such as component availability, component and product value, equipment availability, etc., PBO supports a number of blending objectives shown below. These blending objectives can also be combined in different combinations to ensure that the ultimate blending goal(s) can be achieved:

Property Control	Minimize property off-specification deviation. An <i>Off-Spec Ratio</i> can be used to increase the cost of off-specification properties.
Minimum Cost	Minimize the cost of the blend based on component costs.
Minimum Giveaway	Minimize property deviation from the high or low specification limit, based on property costs.
Minimum Distance	Minimize deviation from the target recipe, or from high or low component limits.

PBO blending objectives can be combined to achieve the ultimate blending goal(s).

In addition to these blending objectives, PBO supports two blend modes:

- **Instantaneous Property Control** – Blend qualities are maintained as close to the specified value as possible without making off-specification product; typically used for blending to a pipeline or ship.
- **Tank Property Control** – Generally used if product is being blended to a tank, the basic goal in this mode is to create a blend tank full of product that is on-specification.

Comprehensive Blend Optimization Model

PBO's Blend Optimizer uses a model of the blending process to determine how to adjust the component feed recipes to meet the desired blending objectives. The blend model consists of a series of equations referred to as "blend laws" specified by the customer. Each blend law equation is used to estimate the value of a given property in the blended product, based on the fraction of each component being fed into the blender and the "blend value" for each component-property pair. In addition to the blend model, equipment constraints based on component flow limitations, and component constraints based on recipe limits, rate of change limits and component volume limits, ensure that the optimized recipe doesn't violate flow controller limitations, or component recipe limitations. Finally, to ensure the blend model is as accurate as possible, model offsets are added to the blend model by comparing the model property estimates with analyzer readings.

Blend Quality Monitoring

PBO continuously monitors the quality of the material in each piece of equipment in the PBO blending area to ensure that the most accurate quality information is used for property control and optimization. The equipment material quality is calculated from the material quality in the connected streams such as the rundown stream for a source tank and the blender stream feeding a destination tank.

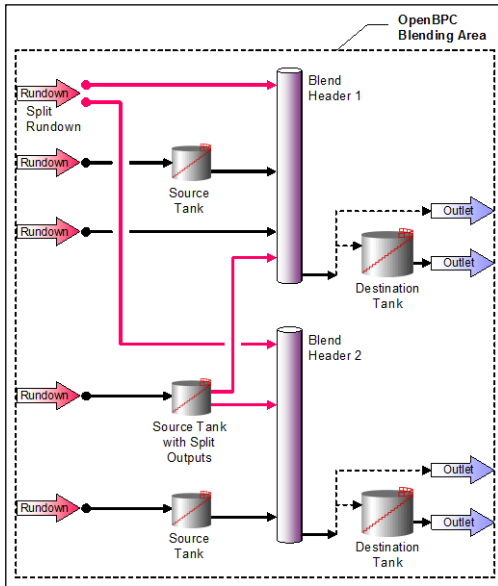
This stream quality data can come from one of six prioritized sources:

- Analyzers
- Lab Results
- Blending Instructions Quality (Note: Blending Instructions is the application that sends recipe information to PBO)
- Tank Quality Data
- Manual Entries
- Model Estimate

Multi-Blender Optimization

PBO supports large optimization problems such as the optimization of multiple, simultaneous, or interactive blenders with rundown streams. Blenders using shared components may

be jointly optimized. An example of a multi-blender configuration supported by PBO is shown below.



PBO supports optimization of complex, interacting blending configurations

Continuous Run-down Blends

PBO supports the use of component streams coming directly from process units which are outside PBO's Blend Area. In this case, the incoming material flow rate often fluctuates and the blending unit is responsible for dealing with all the material that is transferred to it from the upstream process. PBO handles this situation by using the rundown material quality and flow rate information in the blend optimization calculations.

Flexible Reporting

PBO produces a number of reports that are useful for analyzing blend results as shown below.

Optimization Report	Displays blend optimization summary information for the current blend.
Blend Report	Provides a comprehensive report of all of the PBO configuration and blending instruction settings used by PBO for the blend, along with the blend optimization calculation results for each Blend Optimizer execution cycle.
Cycle Report	Displays the component, additive and property data from the last Blend Optimizer execution cycle. It includes the data used in the blend optimization calculation, along with the calculation results.

Off-line Optimization

Blend recipes and blend instructions may be checked offline before the blend is actually started using the PBO Offline Optimizer. The Offline Optimizer supports "What if" scenarios that may be used to:

- Check the feasibility of different blend operating scenarios based on existing operating and configuration data;
- Test blend property control tuning parameters;
- Test and make adjustments to blending instructions prior to their use in online PBO. These updated blending instructions may be transferred back to the blending instructions database for use.

The Offline Optimizer uses a specialized Microsoft® Excel® workbook with an Excel add-in as the interface to the PBO optimization engine.

OPC Compliancy and XML Support

PBO operates in conjunction with any industry standard OPC compliant control system. PBO interfaces to other third party applications, such as blend planning applications, via industry standard XML files. This minimizes or eliminates the need to modify an existing blend control system.

Integration with Honeywell Applications

PBO is a key component of Honeywell's Blending Solution, which is part of the Blending and Movement Management suite. Other components of Honeywell's blending solution are:

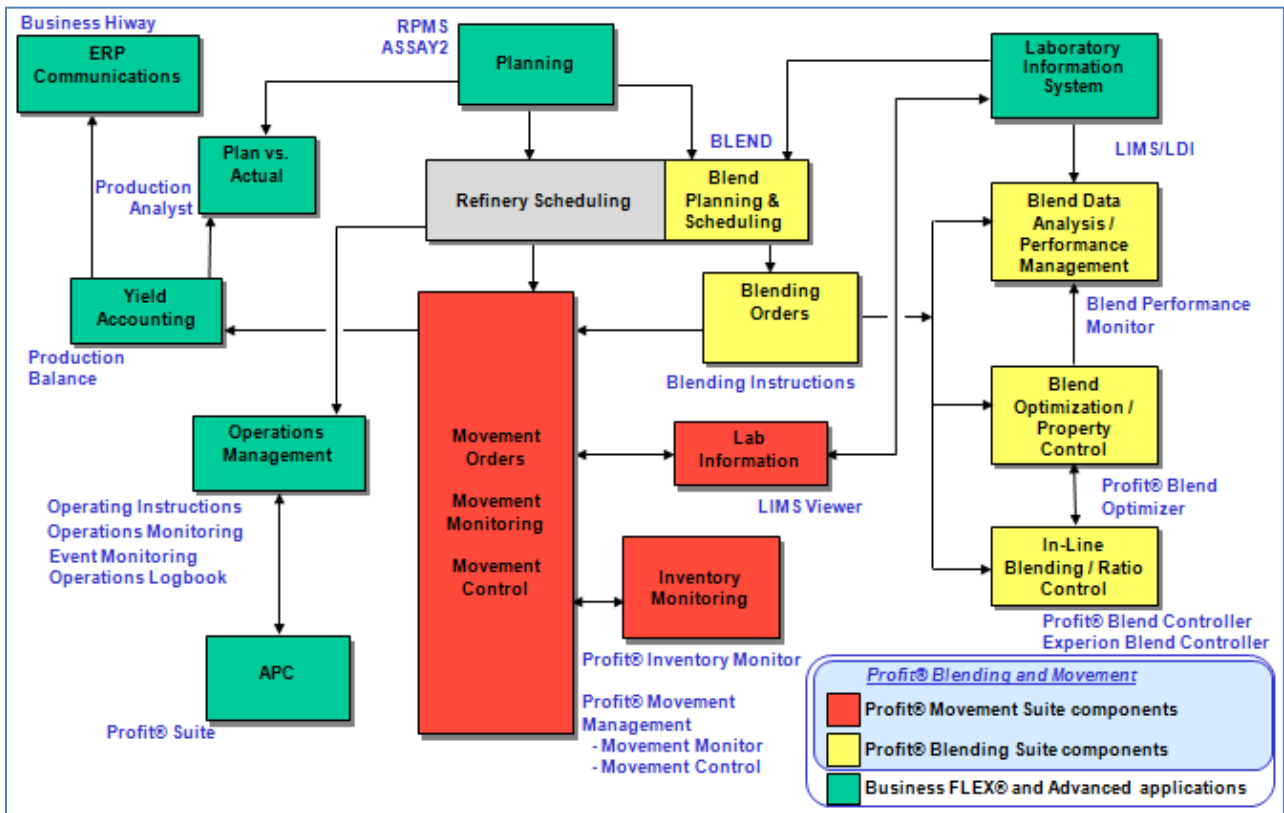
- **BLEND** - Offline multi-period blend planning and event-based scheduling
- **Blending Instructions** - Interface for management and transfer blend recipes / instructions
- **Profit Blend Controller (PBC) & Experion® Blend Controller (EBC)** – Advanced ratio control of in-line blending.
- **Blend Performance Monitor** - Collect, store and manage blend performance metrics
- Together, these components form the Honeywell's Blending solution, a set of integrated tools to deliver optimum in-line blending.

PBO accepts recipes in XML file format from Honeywell's **BLEND** multi-period blend planning and scheduling application leveraging the **Blending Instructions** application.

The **Blending Instructions** application is used to specify how a blending operation is to proceed in the field. Each set of blending instructions contains data that uniquely describes a blend and its associated property model. **Blending Instructions** provides facilities for creating, editing, copying and deleting blending instructions that are, in turn, used by PBO users to define blending operation requirements and ensure that the settings match the physical blending process in the field. These facilities may also be used to define blending operation requirements for field personnel.

Honeywell's **Profit® Blend Controller (PBC)** and **Experion® Blend Controller (EBC)** provide advanced ratio control of in-line blending in Experion PKS control systems. While PBO can integrate with other ratio control applications, when used with **PBC or EBC**, there is additional integration provided that enables control of the PBO application and monitoring of key PBO information from the **PBC and EBC** operator displays.

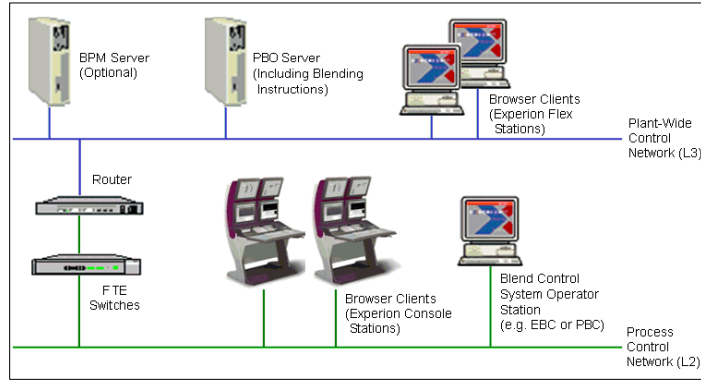
PBO blend data is collected, along with data from other sources, by Honeywell's **Blend Performance Monitor** application, where actual blend data is compared to planned performance. PBO blend data is integrated into a data historian, such as Uniformance PHD, via the **Blend Performance Monitor** application for blend reports and archiving.



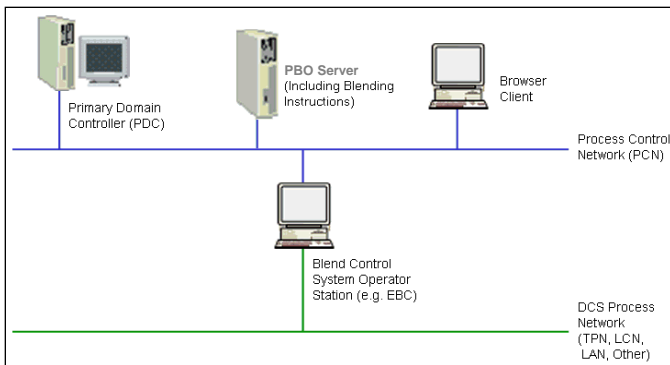
PBO is a key component of Honeywell's Profit® Blending Suite and integrates with other Honeywell applications

System Requirements and Architecture

PBO is designed to operate within the Experion PKS environment or with Legacy and 3rd Party systems. The following illustrations show the sample hardware architectures for both of these configurations. Contact Honeywell for the latest list of supported Experion PKS releases.



Sample PBO Architecture for Experion Controller-based Systems



Sample PBO Architecture for Legacy and 3rd Party Systems

For More Information

Learn more about how Honeywell’s PBO can optimize your blending process. Visit our website www.honeywellprocess.com/software or contact your Honeywell account manager.

Honeywell Process Solutions

Honeywell
1250 West Sam Houston Parkway South
Houston, TX 77042

Honeywell House, Arlington Business Park
Bracknell, Berkshire, England RG12 1EB UK

Shanghai City Centre, 100 Junyi Road
Shanghai, China 20051

www.honeywellprocess.com

PBO runs in its own server that Windows Server 2008 Standard Edition (32-bit) with SP2 or Microsoft Windows Server 2008 R2 Standard Edition (64-bit) with SP1 depending on the version of Experion or other control system supported. The PBO server typically requires Intel Xeon E5620 2.4 GHz Quad-Core or faster processors, with at least 4GB RAM and minimum 146 GB hard disk space. For specific Honeywell computer platforms and supported software that meet these requirements, please contact your Honeywell representative.

Training Services

Training courses addressing PBO implementation, use and maintenance are available through Honeywell’s Automation College (www.automationcollege.com). On-site courses are also offered upon request.

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